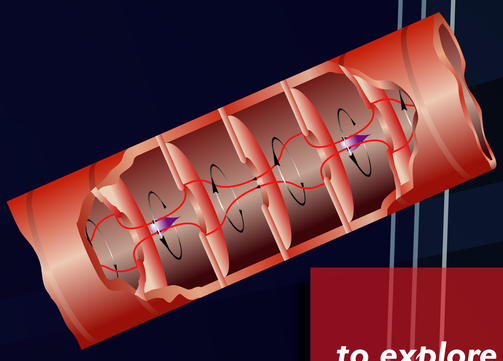
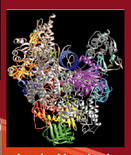


ACCELERATOR SIMULATION

Particle Accelerators provide the means to explore the laws of nature, and enable scientific discoveries and important technological advances. Accelerator modeling via computer simulation is essential for their design and cost optimization.

Accelerators are crucial to advances in High Energy and Nuclear Physics, Materials Science, and Bioscience. The technological advances made possible by accelerators have many applications that benefit the nation's health, environment, & economy.

Observation of CP–violation in the B–sector at PEP–II



Imaging biomolecular structures using synchrotron light sources

Proton Therapy

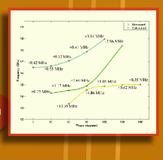
Advanced Computing is Being Used to Address the Challenges of Proposed Next-Generation Accelerators

The DOE Office of High Energy and Nuclear Physics and Office of Advanced Scientific Computing Research, under SciDAC, are supporting a project in Advanced Computing for Accelerator Science and Technology. The project's goal is to develop a comprehensive, terascale Accelerator Simulation Environment and apply it to the design and optimization of DOE's next and current generation accelerators.

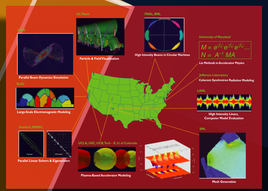
MONITOR
11.875" X 14.75"

Modeling multi-particle dynamics at the Fermilab Booster will help minimize losses in the accelerator and reduce the size of the beam, thus minimizing losses in subsequent stages of the Fermilab accelerator complex.

The Next Linear Collider (NLC) will be much larger and more complex than its predecessor, the SLC.



First Two Dipole Bands & Manifold Modes



Quadrant of the RDDS 6-cell Stack for NLC

Simulation Performed on NERSC's IBM SP2: Elements = 375K DOF = 1.7Million # of Processors = 48

MONITOR
11.875" X 14.75"

Booster performance is crucial to the Fermilab neutrino physics program. An entire Booster cycle consists of 30,000 turns. Simulating 3 million particles through one turn takes five minutes on 64 375 MHz POWER3 processors.